

**IN THE UNITED STATES PATENT AND TRADEMARK OFFICE**

In re Application of:

Arne Berger, et al.

Serial No.: 10/562,662

Filed: December 28, 2005

For: LONGITUDINAL PLUNGING UNIT WITH SECURED CAGE

Attorney Docket No.: GKNQ 1272 PCT

I hereby certify that this correspondence is being sent via facsimile to: Mail Stop PCT, Commissioner for Patents, P.O. Box 1450, Alexandria, VA 22313-1450 fax number (571) 273-8201 on:

April 19, 2006  
Date of Deposit

Angie Moscovitz

  
Signature

**PRELIMINARY AMENDMENT**

Mail Stop PCT  
Commissioner for Patents  
P.O. Box 1450  
Alexandria, VA 22313-1450

Dear Sir:

For the Examiner's convenience, a clean copy of the specification and claims, as amended, is included with this paper.

Prior to examination, please amend the above-identified Application as follows:

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**IN THE TITLE:**

Please amend the title of the application to appear as follows:

LONGITUDINAL PLUNGING UNIT WITH SECURED CAGE ~~SECURING MEANS~~

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**IN THE DRAWINGS:**

Please substitute the two (2) sheets of drawings submitted herewith containing Figures 1, 2, 3 and 4 in place of the originally-filed drawing sheets containing the same Figures.

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**IN THE SPECIFICATION:**

On page 5 of the English language translation of the specification, please amend the first heading of the specification to appear as follows:

Description Technical Field

On page 5 of the English Language translation of the specification, please amend the first full paragraph of the specification to appear as follows:

The invention relates to a longitudinal plunging unit for transmitting torque in a shaft assembly, which longitudinal plunging unit comprises a profiled sleeve with circumferentially distributed, longitudinally extending first ball grooves and a profiled journal with circumferentially distributed, longitudinally extending second ball grooves, wherein the profiled journal engages said profiled sleeve by means of an end facing the profiled sleeve. Pairs of first and second ball grooves contain balls which are arranged in groups and whose axial position relative to one another is fixed by a ball cage which is arranged radially between the profiled sleeve and the profiled journal. The ball cage is displaceable relative to the profiled journal or to the profiled sleeve between spaced axial stops.

On page 5 of the English language translation of the specification, please add a heading between the first and second full paragraphs to appear as follows:

Background

On page 6 of the English Language translation of the specification, please amend the first full paragraph of the specification to appear as follows:

From ~~DE 199 11 111 C1~~ U.S. Patent No. 6,306,045, it is known to work a first annular groove into the profiled sleeve at its end facing the profiled journal and, with axial distance therefrom, to work a second annular groove into the profiled sleeve, wherein in each first and second annular groove a securing ring is inserted, which securing rings form axial stops for the ball cage which is axially displaceable between said stops.

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On page 6 of the English Language translation of the specification, please amend the second full paragraph of the specification to appear as follows:

From ~~DE 102 33 758 A1~~ U.S. Patent No. 6,902,487, it is known to provide an annular stop member at the end of the profiled sleeve facing the profiled journal next to the securing ring, wherein the stop member is arranged radially between the profiled sleeve and the profiled journal. For assembly purposes, the stop member is inserted into the profiled sleeve. It form-fittingly engages the ball grooves and, by means of one end, is supported on a conical portion of the profiled sleeve, whereas the other end serves as a stop face for the ball cage. Producing such a stop member is complicated and expensive because its cross-sectional profile corresponds to the ball grooves. Furthermore, the stop member can be introduced into the sleeve in certain rotational angular positions only as otherwise it would not be able to engage the longitudinally extending ball grooves.

On page 7 of the English Language translation of the specification, please amend the first full paragraph of the specification to appear as follows:

~~US 3 365 914~~ U.S. Patent No. 3,365,914 proposes a rotational coupling having an outer part and an inner part between which, in tracks, rollers are held in a ball cage for torque transmitting purposes. The displacement path of the ball cage is delimited by a shoulder in the outer part on the one hand and by a cover connected to the outer part on the other hand.

On page 7 of the English Language translation of the specification, please amend the second full paragraph of the specification to appear as follows:

~~DE 101 58 544 C2~~ U.S. Patent No. 6,802,781 shows a longitudinal plunging unit wherein the ball cage is able to abut the ball groove run-outs in order to delimit the displacement path.

On page 7 of the English Language translation of the specification, please amend the third full paragraph of the specification to appear as follows:

~~DE 101 23 221 C1~~ U.S. Patent No. 6,705,948 proposes a longitudinal plunging unit wherein the ball cage is able, in both directions, to abut securing rings positioned in annular grooves in the profiled journal. As already mentioned in connection with the

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profiled sleeve referred to above, the annular grooves are arranged in the region of the ball grooves and, respectively, in the region of the ball groove run-outs. When producing the annular grooves in a turning operation, this leads to an interrupted cut as a result of which the tools are subjected to an increase in wear. Furthermore, prior to producing the annular grooves, the components are usually hardened to prevent the formation of burr in the region of the ball grooves, which, in turn, leads to a further increase in tool wear, with the tool service life being reduced further and with the production costs being increased.

On page 7 of the English language translation of the specification, please add a heading between the third and fourth full paragraphs to appear as follows:

Summary Of The Invention

On page 7 and continuing on page 8 of the English language translation of the specification, please amend the fourth full paragraph of the specification to appear as follows:

It is therefore an object of the invention to provide a longitudinal plunging unit which delimits the displacement path of the ball cage and which can be produced in any easy and costsaving way.

On page 8 of the English language translation of the specification, please amend the first full paragraph of the specification to appear as follows:

~~The objective is achieved by a~~ A longitudinal plunging unit for transmitting torque in a shaft assembly[[.]] ~~comprising~~ comprises, a profiled sleeve with circumferentially distributed, longitudinally extending first ball grooves; a profiled journal which comprises a first portion with circumferentially distributed, longitudinally extending second ball grooves with ball groove run-outs, as well as an axially adjoining second portion; balls which are arranged in groups in pairs of first ball grooves and second ball grooves, each time in groups, and a ball cage which is arranged radially between the profiled sleeve and the profiled journal and fixes the balls in their axial position relative to one another,

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wherein the ball cage is displaceable, relative to the profiled hub, between axial stops arranged at a distance from one another and wherein there is arranged an abutment sleeve on the profiled journal, which abutment sleeve is able to abut the profiled journal or a component connected thereto and delimits the displacement path of the ball cage towards the second portion.

On page 8 and continuing on page 9 of the English language translation of the specification, please amend the second full paragraph of the specification to appear as follows:

By arranging the stop sleeve on the profiled journal, it is possible to produce an annular groove axially adjoining the ball groove run-outs in the second portion of the profiled journal in a continuous cut, thus reducing tool wear. "On the profiled journal" in this context means that the stop sleeve is arranged so as to extend coaxially relative to the profiled journal. Preferably, there is provided a radial gap between the stop sleeve and the profiled journal. However, the stop sleeve can also be slid on to the profiled journal with ~~an~~ a press fit, with this solution being preferred if the stop sleeve is produced as a separate component. The inventive solution makes it possible for the stop sleeve to accommodate the axial forces acting on the ball cage and to conduct said axial forces by ~~means of~~ a suitable axial support for the stop sleeve into a region of the profiled journal arranged at a distance from the ball cage. Said axial support axially adjoins the ball groove run-outs in the second portion of the profiled journal which ~~is preferably~~ can be cylindrical in shape. It is thus possible to produce grooves in a continuous cut, which has an advantageous effect on tool wear.

On page 9 of the English language translation of the specification, please amend the first full paragraph of the specification to appear as follows:

In ~~a preferred one~~ an embodiment, the stop sleeve comprises an inner diameter which is greater than a greatest outer diameter of the first portion of the profiled journal. The diameter of the inner bore is thus greater than an outer diameter in the region of the ball grooves of the profiled journal, as a result of which the stop sleeve can easily be slid over the first portion of the profiled journal without there being any need to observe an accurate position of the angle of rotation between the stop sleeve and the profiled journal.

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On page 9 of the English language translation of the specification, please amend the second full paragraph of the specification to appear as follows:

According to a ~~preferred~~ another embodiment, the stop sleeve comprises an outer diameter which is smaller than the smallest inner diameter of the profiled sleeve in the region of the ball grooves. This means that, when the stop sleeve is in a ~~centred~~ centered position, it is not possible for the profiled journal to abut the stop sleeve in the axial direction during assembly or when the longitudinal plunging unit is inserted.

On page 9 of the English language translation of the specification, please amend the third full paragraph of the specification to appear as follows:

The component connected to the profiled journal ~~is preferably provided in the form of~~ can be a ball hub of a fixed joint which is fixed at the end of the profiled journal which faces away from the profiled sleeve. This reduces production costs because there is no need for any special measures for providing an axial support for the stop sleeve at the profiled journal.

On page 10 of the English language translation of the specification, please amend the second full paragraph of the specification to appear as follows:

The stop sleeve can abut a securing ring positioned in an annular groove of the profiled journal, with the annular groove being arranged so as to axially adjoin the ball groove run-out of the profiled journal. The advantage of an annular groove produced in this way ~~consists in~~ is that the cut during production is not interrupted, so that, as compared to producing the annular groove in the ball groove region, the service life of the tool is increased. In addition, the length of the stop sleeve is independent of the distance between the ball groove run-out and the part to be attached. It is thus possible to use an identical stop sleeve for longitudinal plunging units with different fixed joints. On the other hand, the embodiment wherein the stop sleeve is supported directly on the ball hub is advantageous in that there is no need for a securing ring.



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On page 10 and continuing on page 11 of the English language translation of the specification, please amend the third full paragraph of the specification to appear as follows:

In a further ~~preferred~~ embodiment, the stop sleeve can abut an annular collar of the profiled journal which is arranged so as to axially adjoin the ball groove run-out of the profiled journal. A stop is ~~preferably~~ can be produced by carrying out a turning operation on the annular collar, as a result of which – in comparison with the embodiment comprising the securing ring – there is no need to produce the annular groove. In addition, it is possible to do without a securing ring. Furthermore, the length of the stop sleeve is independent of the distance between the ball groove run-out and the component to be attached, for example the ball hub of a constant velocity joint.

On page 11 of the English language translation of the specification, please amend the first full paragraph of the specification to appear as follows:

In a ~~preferred~~ another embodiment, the stop sleeve is produced so as to be integral with the ball cage, which reduces the number of individual components and eliminates the risk of the operatives forgetting to mount the stop sleeve on the profiled journal during the assembly of the longitudinal plunging unit. According to an alternative embodiment, the stop sleeve can also be produced separately. This is advantageous in that it is easy to adjust to different installation conditions without having to change the shape of the ball cage.

On page 11 of the English language translation of the specification, please add a heading between the second and third full paragraphs to appear as follows:

Brief Description Of The Drawings

On page 12 of the English language translation of the specification, please add a heading before the first full paragraph to appear as follows:

Detailed Description

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On page 12 of the English language translation of the specification, please amend the first full paragraph of the specification to appear as follows:

Figures 1 to 4 each show a longitudinal plunging unit 24 in a longitudinal section with a profiled sleeve 25 into which there has been inserted a profiled journal 1 by means of an end 2 facing the profiled sleeve 25. The profiled journal 1 comprises an end 3 which faces away from the profiled sleeve 25 and to which there has been fixed a ball hub 4 of a constant velocity universal joint (not further illustrated here). The profiled sleeve 25 comprises longitudinally extending parallel first ball grooves 26 on its inside. The profiled journal 1, in a first portion 5, comprises longitudinally extending second ball grooves 6 whose circumferential position corresponds to that of the first longitudinal grooves 26. Each ball groove 6 extends from the end 2 of the profiled journal 1, which end 2 faces the profiled sleeve 25, to a ball groove run-out 7. The first portion 5 is followed by a second portion 8 of the profiled journal 1 which does not comprise any ball grooves and which has been provided with an annular collar 9.

On page 12 and continuing on page 13 of the English language translation of the specification, please amend the third full paragraph of the specification to appear as follows:

The possible displacement path of the ball cage 10 relative to the profiled journal 1 is delimited, on the one hand, by a securing ring 27 inserted into an annular groove 12 at the end 2 of the profiled journal 1 and against which the ball cage 10 is able to abut. On the other hand, in Figure 1, the displacement path of the ball cage 10 is delimited by a stop sleeve 13a 13 arranged between the ball cage 10 and the ball hub 4. The stop sleeve 13a 13, by means of a first end 14, is supported on the ball hub 4, the ball cage 10 rests in a planar way against the second end 15 of the stop sleeve 13a 13. The stop sleeve 13a 13 thus prevents the ball cage 10 from moving out of its position shown in Figure 1 towards the end 3 of the profiled journal 1, as a result of which the balls 11 at the joint end of the ball cage are prevented from running into the ball groove run-out. The displacement path of the balls cage 10 relative to the profiled sleeve 25, at the joint end, is delimited by a securing ring (not illustrated) which is inserted into an annular groove 28 at the end of the profiled sleeve 25 and acts as an anti-extraction aid during transport. The securing ring can be abutted by the balls 11 at the joint end, so that the profiled journal 1 is prevented from sliding out of the profiled sleeve 25. At the shaft end, the displacement path of the ball cage 10 is delimited in that it abuts the ball groove run-out. The balls 11 are thus prevented from jamming at the ball groove run-out during transport.

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On page 13 of the English language translation of the specification, please amend the second full paragraph of the specification to appear as follows:

The inner diameter 16 of the stop sleeve ~~43a~~ 13 is dimensioned in such a way that the stop sleeve ~~43a~~ 13 can be slid over the first portion 5 onto the profiled sleeve 25. The inner diameter 16 is greater than the diameter of a circle on which there are positioned outer edges 17 of the ball grooves 6. Furthermore, the inner diameter 16 is greater than an outer diameter 18 of the annular collar 9 so that the stop sleeve ~~43a~~ 13 can also be slid over the second portion 8 of the profiled journal 1.

On page 14 of the English language translation of the specification, please amend the first full paragraph of the specification to appear as follows:

Figure 2 shows a further embodiment of the invention. The difference relative to the embodiment according to Figure 1 is that a stop sleeve ~~43~~ 113 is formed on to the ball cage ~~40~~ 110 so as to be integral therewith. An outer diameter 19 of the stop sleeve ~~43b~~ 113 corresponds an outer diameter 20 of the ball cage ~~40~~ 110 fixing the balls 11. The stop sleeve ~~43b~~ 113 is directly supported on the ball hub 4 of the constant velocity joint.

On page 14 of the English language translation of the specification, please amend the second full paragraph of the specification to appear as follows:

Figure 3 shows an embodiment wherein, as in Figure 2, a stop sleeve ~~43c~~ 213 has been integrally formed on to the ball cage ~~40~~ 210. The stop sleeve ~~43c~~ 213, by means of its first end 14, is supported on a securing ring 21 positioned in an annular groove 22 machined into the annular collar 9. The annular groove 22 can be produced by a continuous cut in the annular collar 9.

On page 14 of the English language translation of the specification, please amend the third full paragraph of the specification to appear as follows:

In the embodiment according to Figure 4, a stop sleeve ~~43d~~ 313 integrally produced at the ball cage ~~40~~ 310 is supported on a stop 23 of the profiled journal 1 which is formed by a step in the annular collar 9. The outer diameter 18 of the annular collar 9 is greater than the inner diameter 16 of the stop sleeve ~~43d~~ 313.